

ABSTRACT

Methods for forming the lower electrode of a capacitor in a semiconductor circuit, and the capacitors formed by such methods are provided. The lower electrode is fabricated by forming a texturizing underlayer and then depositing a conductive material thereover. In one embodiment of a method of forming the lower electrode, the texturizing layer is formed by depositing a polymeric material comprising a hydrocarbon block and a silicon-containing block, over the insulative layer of a container, and then subsequently converting the polymeric film to relief or porous nanostructures by exposure to UV radiation and ozone, resulting in a textured porous or relief silicon oxycarbide film. A conductive material is then deposited over the texturizing layer resulting in a lower electrode have an upper roughened surface. In another embodiment of a method of forming the lower electrode, the texturizing underlayer is formed by depositing overlying first and second conductive metal layers and annealing the metal layers to form surface dislocations, preferably structured as a periodic network. A conductive metal is then deposited in gaseous phase, and agglomerates onto the surface dislocations of the texturizing layer, forming nanostructures in the form of island clusters. The capacitor is completed by depositing a dielectric layer over the formed lower electrode, and forming an upper capacitor electrode over the dielectric layer. The capacitors are particularly useful in fabricating DRAM cells.